

Applications of Behavioral Science to Improve Mine Safety¹

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As discussed in other chapters of this text, engineering intervention from improved lighting to vehicle and machinery design have improved mine safety dramatically. However, because the environmental context of both surface and underground mining is often hazardous, continuously changing, and sometimes unpredictable, it's impossible to protect the miner completely with environmental manipulations. Therefore, mining experts have pointed out the need to complement technological advancements with a focus on the human dimensions of safety, including the application of employee surveys, training series, incentive programs, and feedback presentations (Langton, 1995; Peters, 1995; Peters, Bockosh, and Fotta, 1997). In fact, the U.S. Bureau of Mines referred to the need to apply fundamental psychological principles in the enhancement of miners' ability to recognize and react appropriately to threats in their risky work environment (Kowalski, Folta, and Barrett, 1995). The question remains as to what these fundamental psychological principles are. The present chapter answers this important question.

H. L. Boling (1995) establishes the psychological focus of this chapter by pointing out that, "Today the progressive, productive and safe companies around the world have one common denominator, an innovative safety program that is behavior-based" (p.2). The term "behavior-based safety" has become quite popular among safety professionals, consultants, and members of safety steering committees. It is commonly used to reflect a proactive upstream approach to safety by focusing attention on at-risk behaviors that can lead to an injury and on safe behaviors that can contribute to injury prevention. Beyond this general definition, however, there seems to be substantial misperception, misunderstanding, and misapplication.

A number of recent books detail the principles and procedures of behavior-based safety, and they provide solid evidence for the success of this approach to injury prevention (e.g., Geller, 1996a, 1998a,d; Krause, 1995; Krause, Hidley and Hodson, 1996; McSween, 1995; Sulzer-Azaroff, 1998). Each of these books is consistent with regard to certain basic principles and methods, as well as the beneficial outcomes of behavior-based safety. We offer a brief review of these principles, procedures, and benefits here, and recommend these texts for your follow-up study and continued learning. We start with a definition and rationale for three basic principles reflecting the behavior-based approach.

Principle 1: Focus Intervention on Observable Behavior

The behavior-based approach to safety is founded on behavioral science as conceptualized and researched by B. F. Skinner (1938, 1953, 1974). Experimental behavior analysis, and later applied behavior analysis, emerged from Skinner's research and teaching. He laid the groundwork for numerous therapies and interventions to improve the quality of life of individuals, groups, and entire communities (Geller, Winett and Everett, 1982; Goldstein and Krasner, 1987; Greene et al., 1987). Whether working one-on-one in a clinical setting or with work teams throughout an organization, the intervention procedures always target specific behaviors in order to produce constructive change. In other words, the behavior-based approach focuses on observing what people do, analyzes why they do it, and then applies a research-supported intervention strategy to improve what people do.

Whatever the intervention strategy used to improve a human aspect of safety, the process should target behavior. Whether using training, feedback, injury investigation, coaching, or incentives to benefit safety, focus on behavior. Why? Well, first you can be objective and impersonal about behavior. You can talk about behavior independently from people's opinions, attitudes, and feelings. Behavior varies according to factors in the external world, including equipment design, management systems, the behaviors shown by

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others, and various social dynamics. An open discussion about the environmental and interpersonal determinants of safe versus at-risk behavior can lead to practical modifications of the work culture to encourage safe behavior and discourage at-risk behavior.

Behavior-based intervention *acts people into thinking differently*, whereas person-based intervention *thinks people into acting differently*. The person-based approach is used successfully by many psychiatrists and clinical psychologists in professional therapy sessions, but it is not cost-effective in a group or organizational setting. To be effective, person-focused intervention requires extensive one-on-one interaction between a client and a specially-trained intervention specialist. Even if time and facilities were available for an intervention to focus on internal and nonobservable attitudes and person states, few safety professionals or consultants have the education, training, and experience to implement such an approach. Internal person factors can be improved indirectly, however, by directly focusing on behaviors in certain ways.

The key is to focus on behavior and you'll be on the right track, whatever the intervention approach. It's *behavior-based* commitment, *behavior-based* goal-setting, *behavior-based* feedback, *behavior-based* training, *behavior-based* recognition (Geller, 1997a), *behavior-based* incentives and rewards (Geller, 1996b), and so on.

Principle 2: Look for External Factors to Improve Performance

Internal person dimensions like attitudes, perceptions, and cognitions are difficult to define objectively and change directly. So stop trying! Most of us don't have the education, training, experience, nor time to deal with people's attitudes or person states directly. Instead, you should look for external factors influencing behavior independent of individual feelings, preferences, and perceptions. When you empower people to analyze behavior from a systems perspective and implement interventions to improve behavior, you will indirectly improve their attitude, commitment, and internal motivation.

In the first widely-used American textbook in psychology, *Principles of Psychology*, William James (1890) explained the reciprocity between behavior and attitude as follows:

Sit all day in a moping posture, sigh, and reply to everything with a dismal voice, and your melancholy lingers ... If we wish to conquer undesirable emotional tendencies in ourselves, we must ... go through the outward movements of those contrary dispositions which we prefer to cultivate.

Careful observation and analysis of ongoing work practices can pinpoint many potential causes of safe and at-risk behaviors. Those causes external to people -- including reward and punishment contingencies, policies, or supervisory behaviors -- can often be altered for the improvement of both behavior and attitude. In contrast, internal person factors are difficult to identify, and if defined, they are even more difficult to change directly. So with behavior-based safety the focus is placed on external factors -- environmental conditions and behaviors -- which can be changed upstream from a potential injury.

Principle 3: Focus on Positive Consequences to Motivate Safety Improvement

The ABC contingency is a basic tenet of behavior-based safety. "A" stands for "activator," or the antecedent events that direct behavior (B). And "C" refers to "consequence," or the environmental stimuli that motivate behavior. We do what we do to gain a positive consequence or to escape or avoid a negative consequence. And, we stop doing what we're doing when our behavior results in immediate negative consequences.

The most powerful motivating consequences are "soon" and "certain." That's why most at-risk behavior occurs. Compared to safe behavior, at-risk behavior provides the worker with such soon and certain consequences as comfort, convenience, perceived efficiency, and faster job completion.

As this third principle indicates, using positive over negative consequences is critically important. It's relevant to "attitude," and many other internal dimensions of people. Think about it. How does a reward, personal recognition, or a group celebration make you feel compared to a reprimand or criticism? Both consequences can be significant with regard to behavioral impact. The difference is in the accompanying attitude or feeling state.

As detailed elsewhere (Geller, 1996a, 1997a, 1998d), when positive recognition is delivered correctly, it does more than increase the frequency of the behavior it follows. It also increases the likelihood other safe behaviors will occur, and that positive recognition will be used more often to benefit both behavior and attitude. The popular common sense belief that we learn more from our mistakes than our achievements is wrong. We learn more from our successes. So recognizing people's safe behavior will facilitate more learning and positive motivation than will criticizing people's at-risk behavior. Remember that only with positive consequences can you improve both behavior and attitude at the same time.

Don't Rely on Common Sense

More explanations for these and additional principles of behavior-based safety are presented elsewhere (Geller, 1997b, 1998c). These three principles are most critical with regard to the development of interventions to improve the human dynamics of mine safety. Do they sound like plain old common sense to you? If so, we're glad. But we must warn you that others will not necessarily feel the same without appropriate education, training, or experience. Common sense or intuition is often incorrect. What sounds good to one person will not necessarily sound right to another. Consider, for example, the following common-sense strategies people have implemented in an attempt to deal with the human dynamics of safety.

- Punish a person who returns to work after a lost-time injury.
- Implement a safety incentive program whereby everyone in an organization gets a prize if no one reports an injury.
- Set up a "safe employee of the month" program in which one individual in a large facility is publicly recognized for having the "Best Safety Attitude."
- Establish an observation system whereby employees must observe one unsafe condition or behavior each day and "stop" it.
- Invite a motivational speaker to address all employees with themes like "Try Harder," "Change Your Attitude About Safety," "Self-Affirmation is the Key to Motivation," or "Safety Awareness and a Positive Attitude are Key to Behavior Change."
- Post signs with slogans like "Think Safety," "Safety is a Condition of Employment," "Zero Accidents is Our Goal," "Safety is a Priority," or "All Injuries are Preventable."

Do any of these psychological tactics sound familiar? All of these strategies are ineffective and run counter to the three behavior-based principles described above. Some of these techniques can actually do more harm than good to the human dynamics of industrial safety and health. Yet, I'm sure you've seen, perhaps even experienced, some of these intervention approaches. Why? Because they seemed like good common sense to someone.

It takes empirical investigation, not common sense, to guide the development and implementation of an improvement intervention, whether repairing a bridge, constructing a building, or administering an incentive/reward process. "Contrary to popular belief, there is not too little common sense in business, there is too much" (Daniels, 1994, p. 10).

Behavior-based safety, as reflected in the three principles described here, is based on more than 40 years of rigorous research. And with additional research, the methods and tools of behavior-based safety will continuously improve. Let's consider a general behavioral safety method which has been used by several researchers to evaluate the effectiveness of specific intervention techniques to prevent injury (e.g., Fellner and Sulzer-Azaroff, 1984; Geller, 1988; Komaki, Heinzmann and Lawson, 1980; Ludwig and Geller, 1997;

Sulzer-Azaroff and DeSantamaria, 1980). It has also been used by numerous organizations to improve their safety performance (cf. Geller, 1996a, 1998d).

The DO IT Process

The DO IT process puts people in control of improving behaviors and thereby preventing injuries. It is a general method for solving the behavioral dimensions of safety problems. It provides objective data for exploring why certain safety-related behaviors occur or don't occur and for evaluating the impact of interventions designed to increase safe behavior or decrease at-risk behavior. If an intervention does not produce a desired effect, it is either refined or replaced with a completely different behavior-change approach.

"D" for Define

The process begins by defining certain behaviors to work with. These are the targets of the behavior improvement process. They are safe behaviors that need to increase or at-risk behaviors that need to decrease. Avoiding at-risk behaviors often requires certain safe behaviors, and therefore safe targets might be behaviors that substitute for particular at-risk behaviors. On the other hand, a safe target behavior can be defined independently of an associated at-risk behavior. The definition of a safe target might be as basic as using certain personal protective equipment (PPE) or "walking within pedestrian walkways." Or the safe target could be a process requiring a particular sequence of safe behaviors, as when lifting, parking a truck for unloading, or locking out energy sources.

Deriving a precise definition of a DO IT target is facilitated with the development of a checklist that can be used to evaluate whether a certain target behavior or process is being performed safely. Just developing such behavioral definitions can lead to valuable learning. When people get involved in developing a behavioral checklist, they own a training process that can improve human dynamics on both the outside (behaviors) and the inside (feelings and attitudes) of people.

"O" for Observe

When people observe each other for certain safe or at-risk behaviors, they realize everyone performs at-risk behavior, sometimes without even knowing it. The observation stage is not fault-finding, but is a fact-finding process to facilitate the discovery of behaviors and conditions that need to be changed or continued in order to prevent injuries.

The behavioral observations are only done with the awareness and permission of the person being observed. Unannounced observations might give a more realistic picture of the at-risk behaviors, but such audits reduce interpersonal trust and give the impression that behavior-based safety is a negative "gotcha" program. And from a behavior-change perspective, observations without permission cannot raise safety "mindfulness" (Geller, 1999a; Langer, 1989). It's likely the mindfulness developed and increased from an up-front and voluntary behavioral observation process is critical for behavior change and injury prevention.

It's easy to fall into a mindless job routine, and become incapable of handling unexpected events in a safe and timely manner. Plus, some mindless behavior can put a person in immediate risk for personal injury. We need to understand that this can happen to anyone and warrants a concerted effort to increase people's mindfulness on the job. A behavior-based observation and feedback process provides the mechanism for making this happen.

Regarding the development of an observation process, teams of workers need to decide:

- What kind of checklist to use during observations?
- Who will conduct the behavioral observations?
- How often will the observations be conducted?
- How will data from the checklist be summarized and interpreted?
- How will people be informed of the results from an observation process?

There is not one generic observation procedure for all situations, and the customization and refinement of a process for a particular setting should never stop. It's often advantageous to begin with a limited number of behaviors and a relatively simple checklist. This reduces the possibility that some people will feel overwhelmed at the start. Starting small also enables the broadest range of voluntary participation, and provides numerous opportunities to successively improve the process by expanding its coverage of both behaviors and work areas.

"I" for Intervene

During this stage, interventions are designed and implemented in an attempt to increase safe behavior and/or decrease at-risk behavior. As reflected in Principle 2 above, intervention means changing external conditions of the system in order to make safe behavior more likely than at-risk behavior. When designing interventions, Principle 3 is your guide. Specifically, the most motivating consequences are soon, certain, and sizable. And, positive consequences are preferable to negative consequences.

The process of observing and recording the frequency of safe and at-risk behavior on a checklist provides an opportunity to give individuals and groups valuable behavior-based feedback. When the results of a behavioral observation are shown to individuals or groups, they receive the kind of information that enables practice to improve performance. Considerable research has shown that providing workers with feedback regarding their safe and at-risk behaviors is a very cost-effective intervention approach for improving safety performance (e.g., Geller, 1996a; Krause et al., 1996; Reber, Wallin and Chhoker, 1990; Sulzer-Azaroff and DeSantamaria, 1980; McAfee and Winn, 1989; Petersen, 1989).

In addition to behavioral feedback, researchers have found a number of other intervention strategies to be effective at increasing safe work practices. These include worker-designed safety slogans, "near hit" and corrective action reporting, safe behavior promise cards, individual and group goal-setting, actively caring thank-you cards, safety coaching, as well as incentive/reward programs for individuals or groups. These are described elsewhere (Geller, 1996a, 1998d), some having been applied in mining settings (Fox, Hopkins and Anger, 1987; Rhoton, 1980). Later in this chapter we offer guidelines for matching the intervention strategy with the behavioral target and situation.

"T" for Test

The test phase of DO IT provides work teams with the information they need to refine or replace a behavior-change intervention, and thereby improve the process. If observations indicate significant improvement in the target behavior has not occurred, the work team analyzes and discusses the situation, and refines the intervention or chooses another intervention approach. On the other hand, if the target reaches the desired frequency level, the participants can turn their attention to another set of behaviors. They might add new critical behaviors to their checklist, thus expanding the domain of their behavioral observations. They might design a new intervention procedure to focus only on the new behaviors.

Every time the participants evaluate an intervention approach, they learn more about how to improve safety performance. They have essentially become behavioral scientists, using the DO IT process to: a) diagnose a human dynamics problem, b) monitor the impact of a behavior-change intervention, and c) refine interventions for continuous improvement. The results from such testing provide motivating consequences to support this learning process and keep the participants involved.

Let's consider some basic principles about behavior and behavior-change techniques that can facilitate the development of the most effective intervention for a particular situation. First, it's important to understand the difference between other-directed, self-directed, and automatic behavior (Watson and Tharp, 1993).

Three Types of Behavior

On-the-job behavior starts out as other-directed, in the sense that we follow someone else's instructions. Such direction can come from a training program, an operation's manual, or a policy statement. After

learning what to do, essentially by memorizing or internalizing the appropriate instructions, our behavior enters the self-directed stage. In other words, we talk to ourselves or formulate an image before performing a behavior in order to activate the right response. Sometimes we talk to ourselves after performing a behavior in order to reassure ourselves we performed correctly or to figure out ways to do better next time. At this point we're usually open to corrective feedback if it's delivered well by a person we trust.

After performing some behaviors frequently and consistently over a period of time they become automatic. A habit is formed. Some habits are good and some are not good, depending on their short and long-term consequences. If implemented correctly, rewards, recognition, and other positive consequences can facilitate the transfer of behavior from the self-directed phase to the habit phase.

Of course our self-directed behavior is not always desirable. When we take a short cut, for example, we are choosing intentionally to ignore a safety precaution in order to perform more efficiently or with more comfort or convenience. In this state, people are "consciously incompetent." Attempts to change self-directed behavior from incompetent to competent is often difficult, because it usually requires a relevant change in personal motivation.

Before a bad habit can be changed to a good habit, the target behavior must become self-directed. In other words, people need to become aware of their undesirable habit (as in at-risk behavior) before adjustment is possible. Then, if the person is motivated to improve, their new self-directed behavior can become automatic.

Let's see what kinds of behavior-based interventions are appropriate for the three transitions alluded to above:

- Turning a risky habit (when the person is unconsciously incompetent) into safe self-directed behavior.
- Changing risky self-directed behavior (when the person is consciously incompetent) to safe self-directed behavior.
- Turning safe self-directed behavior (when the person is consciously competent) into a safe habit (unconscious competence).

Three Kinds of Intervention Strategies

Behavior-based safety trainers and consultants teach the ABC model (or three-term contingency) as a framework to understand and analyze behavior or to develop interventions for improving behavior. As given in Principle 3 above, the "A" stands for activators or antecedent events that precede behavior or "B", and "C" refers to the consequences following behavior and produced by it. Activators direct behavior, whereas consequences motivate behavior.

Activators and consequences are external to the performer (as in the environment), or they are internal (as in self-instructions or self-recognition). They can be intrinsic or extrinsic to a behavior, meaning they provide direction or motivation naturally as a task is performed (as in a computer game), or they are added to the situation extrinsically in order to improve performance. An incentive/reward program is external and extrinsic. It adds an activator (an incentive) and a consequence (a reward) to the situation in order to direct and motivate desirable behavior (Geller, 1996b).

Instructional Intervention

An instructional intervention is typically an activator or antecedent event used to get new behavior started or to move behavior from the automatic (habit) stage to the self-directed stage. Or it is used to improve behavior already in the self-directed stage. The aim is to get the performer's attention and instruct him or her to transition from unconscious incompetence to conscious competence. You assume the person wants to improve, so external motivation is not needed -- only external and extrinsic direction.

This type of intervention consists primarily of activators, as exemplified by education sessions, training exercises, and directive feedback. Since your purpose is to instruct, the intervention comes before the

target behavior and focuses on helping the performer internalize your instructions. As we've all experienced, this type of intervention is more effective when the instructions are specific and given one-on-one. Role playing exercises provide instructors opportunities to customize directions specific to individual attempts to improve. Plus, they allow participants the chance to receive rewarding feedback for their improvement.

Supportive Intervention

Once a person learns the right way to do something, practice is important so the behavior becomes part of a natural routine. Continued practice leads to fluency and in many cases to automatic or habitual behavior. This is an especially desirable state for safety-related behavior. But perfect practice does not come easily, and benefits greatly from supportive intervention. We need support to reassure us we are doing the right thing and to encourage us to keep going.

While instructional intervention consists primarily of activators, supportive intervention focuses on the application of positive consequences. Thus, when we give people rewarding feedback or recognition for particular safe behavior, we are showing our appreciation for their efforts and increasing the likelihood they will perform the behavior again. Each occurrence of the desired behavior facilitates fluency and helps build a good habit.

Thus, after people know what to do, they need to perform the behavior correctly many times before it can become a productive habit. Therefore, the positive reinforcement we give people for their safety-related behavior can go a long way toward facilitating fluency and a transition to the automatic or habit stage. Such supportive intervention is often most powerful when it comes from one's peers -- as in peer support.

Note that supportive intervention is typically not preceded by a specific activator. In other words, when you support self-directed behavior you don't need to provide an instructional antecedent. The person knows what to do. You don't need to activate desired behavior with a promise (an incentive) or a threat (a disincentive). The person is already motivated to do the right thing.

Motivational Intervention

When people know what to do and don't do it, a motivational intervention is needed. In other words, when people are consciously incompetent about safety-related behavior, they require some external encouragement or pressure to change. Instruction alone is obviously insufficient because they are knowingly doing the wrong thing. In safety we refer to this as taking a calculated risk.

We usually perform calculated risks or take short cuts because we perceive the positive consequences of the at-risk behavior to be more powerful than the negative consequences. This is because the positive consequences of comfort, convenience, and efficiency are immediate and certain, while the negative consequence of at-risk behavior (such as an injury) is improbable and seems remote. Furthermore, the safe alternative is relatively inconvenient, uncomfortable, or inefficient; and these negative consequences are immediate and certain. As a result, we often need to add both activators and consequences to the situation in order to move people from conscious incompetence to conscious competence.

This is when an incentive/reward program is useful. Such a program attempts to motivate a certain target behavior by promising people a positive consequence if they perform it. The promise is the incentive and the consequence is the reward. In safety, this kind of motivational intervention is much less common than a disincentive/penalty program. This is when a rule, policy, or law threatens to give people a negative consequence (a penalty) if they fail to comply or take a calculated risk.

Often a disincentive/penalty intervention is ineffective, because like an injury, the negative consequence or penalty seems remote and improbable. The behavioral impact of these enforcement programs are enhanced by increasing the severity of the penalty and catching more people taking the calculated risk. But the large-scale implementation of this kind of intervention can seem inconsistent and unfair. And because threats of

punishment appear to challenge individual freedom and choice (Skinner, 1971), this approach to behavior change can backfire and activate more calculated risk taking, even sabotage, theft, or interpersonal aggression.

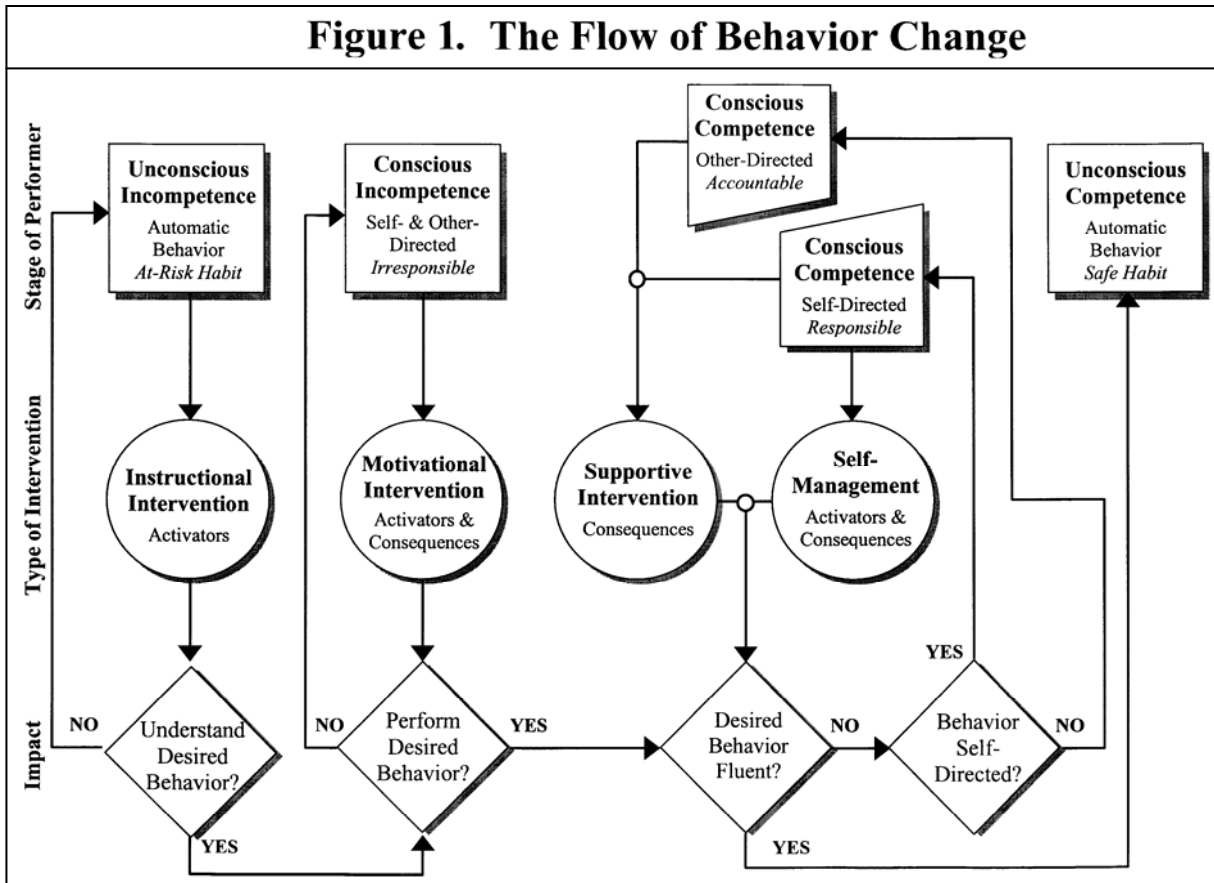
Motivational intervention is clearly the most challenging, requiring enough external influence to get the target behavior started without triggering a desire to assert personal freedom. Remember the objective is to motivate a transition from conscious incompetence to a **self-directed** state of conscious competence. Powerful external consequences might improve behavior only temporarily, as long as the behavioral intervention is in place. Hence the individual is consciously competent, but the excessive outside control makes the behavior entirely other-directed. Excessive control on the outside of people can limit the amount of control or self-direction they develop on the inside.

A long-term implementation of a motivational intervention, coupled with consistent supportive intervention, can lead to a good habit. In other words, with substantial motivation and support, other-directed safe behavior can transition to unconscious competence without first becoming self-directed.

Summary

Figure 1 (on the next page) reviews this intervention information by depicting relationships between four competency states (unconscious incompetence, conscious incompetence, conscious competence, and unconscious competence) and four intervention approaches (instructional intervention, motivational intervention, and self-management). When people are unaware of the safe work practice (i.e., they are unconsciously incompetent), they need repeated instructional intervention until they understand what to do. Then, as depicted at the far left of Figure 1, the critical question is whether they perform the desired behavior. If they do, the question of behavioral fluency is relevant. A fluent response becomes a habit or part of a regular routine, and thus the individual is unconsciously competent.

When workers know how to perform a task safely but don't, they are considered consciously incompetent or irresponsible. This is when an external motivational intervention can be useful, as discussed earlier. Then when the desired behavior occurs at least once, supportive intervention is needed to get the behavior to a fluent state.



Accountability Versus Responsibility

From the perspective of large-scale safety and health promotion, the differentiation in Figure 1 between accountable and responsible is critical. People often use the words accountability and responsibility interchangeably. Whether you hold someone accountable or responsible for getting something done, you mean the same thing. You want that person to accomplish a certain task, and you intend on making sure it happens. However, let's consider the receiving end of this situation. How does a person feel about an assignment -- does he or she feel accountable or responsible? Here's where a distinction is evident.

When you are held accountable, you are asked to reach a certain objective or goal, often within a designated time period. But you might not feel responsible to meet the deadline. Or, you might feel responsible enough to complete the assignment, but that's all. You do only what's required and no more. In this case, accountability is the same as responsibility.

There are times, however, when you extend your responsibility beyond accountability. You do more than what's required. You go beyond the call of duty as defined by a particular accountability system. This is often essential when it comes to industrial safety and health. To improve safety beyond the current performance plateau experienced by many companies, workers need to extend their responsibility for safety beyond that for which they are held accountable. They need to transition from an other-directed state to a self-directed state.

Many mining tasks are accomplished by a lone worker. There's no supervisor or coworker around to hold the employee accountable for performing the job safely. So the challenge for safety professionals and corporate leaders is to build the kind of work culture that enables or facilitates responsibility or *personal* accountability for safety. An accountability system is needed that encourages personal involvement and commitment for safety. Then you'll start a spiral of accountability feeding responsibility, feeding more involvement and more responsibility, resulting in people becoming totally committed to achieving an injury-free workplace. Psychological research on relationships between environmental conditions or contingencies (as in an accountability system) and people's feeling states (like personal accountability or responsibility) suggests five general ways to make this happen. (More details are given in Geller, 1998a.)

Decrease Top-Down Controls for Safety

Mine safety is often a confrontation between a rule enforcer and a rule breaker. As such, safety is viewed as compliance with certain safety policies and mandates. One person holds another accountable for at-risk behavior, as in: "I saw what you did." Safety becomes a 'gotcha' game, one dictated by MSHA standards and unwittingly supported by corporate rules and regulations. Then the primary job of safety personnel is to check for worker compliance with safety procedures and to correct incidences of noncompliance. Making safety a priority means increasing the enforcement of safety policies. This climate leads to fault finding and punishment contingencies, both which prevent the development of personal accountability.

Promote fact finding. If you want to increase people's responsibility for safety, you need to focus on fact finding, not fault finding. An injury or "near hit" results from several causes, some having nothing to do with the person directly involved. Improving safety depends upon discovering all the factors contributing to injury potential. We can't do this if the work context makes people unwilling or frightened to discuss an incident openly because they're afraid of being blamed or punished. Removing fear of failure is critical to developing internal feelings of personal accountability (cf. Geller, 1999c).

Decrease punishment. In many work cultures, holding people accountable means punishing them for the mistakes they make. This can impede responsibility for reporting errors, calculated risks and near hits, and for looking for ways to reduce them. Geller (1996a, 1998a,d) has outlined various situations in which punishment is not desirable, and discussed why mistakes and human error never warrant punishment. Here we want to make the point that punishment procedures typically stifle the openness and interpersonal trust needed to conduct a responsible incident analysis and derive an effective corrective action plan.

Increase Feelings of Empowerment. From a psychological perspective, empowerment is *not* holding people accountable to do more. It is *feeling* empowered or responsible to do more. Employees need to be asked, "What will it take to make you feel more empowered or personally responsible for safety around here?" Seeking frank answers to this question and then struggling to make the changes requested will probably do more to increase employee involvement, commitment, and responsibility for safety than anything else.

The type of accountability system in place to evaluate the safety performance of individuals, work teams, and the entire work force influences whether people feel empowered and responsible to improve safety. Research indicates that for an accountability system to promote personal responsibility it needs to:

- be proactive,
- promote the reporting of all injuries, near hits, and property damage incidents,
- distinguish between the journey (process goals) and the destination (outcome goals or vision),
- hold people accountable for results they can control,
- use recognition, rewards, and celebrations to shape process behaviors,
- consider environment, behavior, and person factors in all incident investigations,
- include daily audits of work practices and environmental conditions, as well as periodic assessments of perceptions and person states (through interviews, focus group meetings, and plant-wide surveys).

Help People Feel Important

When people's feelings of importance related to safety increase, their personal responsibility for safety also increases. So a rationale for decreasing top-down control over safety is that enforcement or punishment procedures decrease the recipient's sense of importance. And the strategies reviewed above for increasing feelings of empowerment also enhance personal perceptions of importance.

When people have choices in a situation they feel more important. And when their sense of importance is increased, they want to get more involved and make more choices. That's why it's important to first teach everyone the theory and principles behind a new process, and then help teams customize specific procedures for their work areas. The choice process will be motivating in itself, and promote a sense of ownership for the methods and tools. This leads naturally to both personal and interpersonal accountability to make the process work.

Cultivate Belonging and Interpersonal Trust

According to a recent study of 20 companies in the midst of implementing some form of behavior-based safety, trust in management's ability to support the process was a critical determinant of employee involvement (DePasquale and Geller, in press; Geller et al., 1998). Furthermore, building a spirit of community or belonging among coworkers will increase their sense of personal responsibility for industrial safety and health. The improvement of work practices requires interpersonal observation and feedback. But for this to happen, people need to adopt a collective win/win perspective instead of the individualistic win/lose orientation common in many work settings. People who feel a sense of belonging, trust, and win/win interdependency with their coworkers will also feel responsible for their coworkers' safety.

Ways to measure and increase interpersonal trust in a work setting are detailed elsewhere (Geller, 1998b, 1999b). Here we review key points from these sources. Remember that a "we-they" mentality inhibits trust-building. People need to appreciate and respect each other's differences. People's safety in the system is interdependent, and their participation is critical for the organization's synergistic success. But building the kind of belonging and trust needed to break down independent perspectives and we-they barriers is an

ongoing and never-ending process. You can help make this happen by promoting the following "C" words in yourself and others.

Communication. How we interact with others is obviously a key determinant of interpersonal trust. What people say and how they say it influences our trust in both their capabilities and their intentions. An individual's expertise is displayed by the person's spoken or written words, and by the confidence and credibility linked to the words. You've probably experienced many times that the way something is said, including intonation, pace, facial expressions, hand gestures, and overall posture, has greater impact than what was actually said. And, you've certainly experienced personal feelings of trust toward another person change as the result of how that individual communicated information.

We can get others to trust our knowledge, skill, or ability by our actions. Presenting our case with clarity, confidence, and charisma certainly helps. But what about trust in intentions? Do you know people who have impressive credentials and communicate elegantly, but something makes you suspicious about their intentions? You believe they know what to do, but you're not convinced they will do what they say. They have the right talk, but give the impression they don't walk it.

One of the most powerful communication strategies for increasing trust in intention is active listening. When you listen to others first before communicating your own perspective, you not only increase the chance they will reciprocate and listen to you, you also learn how to present your message for optimal understanding, appreciation, and buy-in.

Caring. When you take the time to listen to other people's perspectives, you send a most important message that you care about them. And when people believe you care about them, they will care about what you tell them. They trust you will look out for them when applying your knowledge, skills, or abilities. They trust your intentions because they believe you care.

You also communicate caring and build interpersonal trust when you ask questions. We're not talking about the typical general questions we often ask people we haven't seen for awhile. We ask, "How are you doing?" and we get the standard reply "I'm doing fine, how about you?" No, we're referring to informed inquiry about a particular task or set of circumstances. Questions targeting a specific aspect of a person's job send the signal you care about him or her. This communication is more than a general greeting. It's a statement of genuine interest in a person's behavior and feelings. It's especially powerful when it reflects active caring about health and safety.

In order to show caring with specific behavior-based questions, you need to take the time to learn what others are doing. This comes from active listening and behavior-based observation. You've heard the phrase "walk the talk." Well, here we're talking about "hearing to the talk, and watching the walk." This shows you care, and gives you an opportunity to "talk the walk" so people will trust your intentions.

Candor. We trust people who are frank and open with us. They don't beat around the bush. They get right to the point, whether asking for a favor or giving us behavioral feedback. And when these individuals don't know an answer to a question, they don't ignore us or hem and haw about possibilities. They tell us outright when they don't know something, and they tell us they'll get back to us later. And when they get back to us soon with an answer, our trust in both their intention and ability increases.

The second definition of "candor" in my American Heritage (1991) dictionary reflects another important aspect of trust-building -- "freedom from prejudice" (p.233). When people's interactions with you reflect prejudice or the tendency to evaluate or judge another person on the basis of a stereotype or preconceived notion about group characteristics, you have reason to mistrust these individuals, both in their ability to evaluate others and in their intentions to treat people fairly. And, your trust in these persons decreases even when the prejudice is not directed toward you.

When a person gives an opinion about another person because of race, religion, gender, age, sexual orientation, or birthplace, you should doubt this individual's ability to make people-related decisions. You

should wonder whether their intentions to perform on behalf of another individual will be biased or tainted by a tendency to pre-judge people on the basis of overly simple and usually inaccurate stereotypes.

Consistency. Perhaps the quickest way to destroy interpersonal trust is not to follow through on an agreement. How often do we make a promise we don't keep? Most promises are behavior-consequence contingencies. We specify that a certain consequence will follow a certain behavior. Whether the consequence is positive or negative, trust decreases when the behavior is not rewarded or punished as promised.

One of the problems with punishment contingencies is that they are difficult to implement fairly and consistently. It's easy to state a policy that anyone not using appropriate personal protective equipment will be "written up," but it's quite difficult or impossible to carry out this contingency consistently for a large workforce. What about safety incentive programs that offer everyone rewards when no injuries occur over a designated time period and participants observe coworkers getting hurt but not turning in an injury report? And, how about a "safe employee of the month" program that selects winners according to nonobjective criteria or doesn't consider everyone consistently as a potential award recipient? You risk the possibility of trust reduction every time you implement a contingency (such as a punishment policy or incentive program) that is not administered fairly and consistently.

Commitment. People who are dependable and reliable are not only showing consistency, they are demonstrating commitment. When you follow through on a promise or pledge to do something, you tell others they can count on you. You can be trusted to do what you say you will do. Making a commitment and honoring it, builds trust in both intention and ability.

Telling a personal anecdote to illustrate a point is often a good way to demonstrate commitment for something. And when this commitment is consistent with the theme of your speech or written presentation, your credibility increases. The audience has reason to trust your intentions to give accurate and useful information.

Consensus. Demonstrating personal commitment to a mission, purpose, or goal helps to build group consensus. And when a group of people reach consensus about something, all group members agree on a decision or course of action and are willing to support it. Leaders or group facilitators who develop consensus among people are trusted. This is the opposite of top-down decision making, and is not the same as negotiating, calling for a vote and letting the majority win, or working out a compromise between two differing sets of opinions.

Whenever the results of a group decision-making process comes across as "win-lose," some mistrust is going to develop. A majority of the group might be pleased, but others will be discontent and might actively or passively resist involvement. And even the "winners" could feel lowered interpersonal trust. "We won this decision, but what about next time?" And without solid back-up support of the decision, the outcome will be less than desired. "Without everyone's buy-in, commitment, and involvement, we can't trust the process to come off as expected."

So how can group consensus be developed? How can the outcome of a heated debate on ways to solve a problem be perceived as a win-win solution everyone supports? How can a win-lose compromise or negotiation perceived to depreciate interpersonal trust be avoided? Solutions are more easily spoken than accomplished. Consensus-building takes time and energy, and requires candid, consistent, and caring communication among all members of a discussion or decision-making group (Geller, 1998b; Rees, 1997). In other words, when people demonstrate the C-words discussed here for building trust in interpersonal dialogue, they also develop consensus and more interpersonal trust regarding a particular decision or action plan.

However, building consensus around a group process or action plan is not easy. There's no quick fix to doing this. It requires plenty of interpersonal communication, including straightforward opinion sharing, intense discussion, emotional debate, active listening, careful evaluation, methodical organization, and systematic prioritizing. But on important matters, the outcome is well worth the investment. When you

develop a solution or process that every potential participant can get behind and champion, you have cultivated the degree of interpersonal trust needed for total involvement. Involvement in turn builds personal commitment, more interpersonal trust, and then more involvement.

Character. This final C-word for trust-building means different things to many people. But generally, a person with "character" is considered honest, ethical, or principled. People with character are credible or worthy of another person's trust because they display confidence and competence in following a consistent set of personal beliefs. They are believable and trusted because they know who they are; they know where they want to go; and they know how to get there.

All of the strategies discussed here for cultivating a trusting culture are practiced by a person with character. Therefore, this C-word epitomizes interpersonal trust from both an intention and capability perspective. We'd like to add a few additional trust-building methods, however, that especially fit this category, although they do overlap with other C-words discussed here.

First, individuals with character are willing to admit vulnerability. They realize they aren't perfect and need behavioral feedback from others. They know their strengths and weaknesses, and find exemplars to model. By actively listening to others and observing their behaviors, individuals with character learn how to improve their own performance. And if they're building a high performance team, they can readily find people with knowledge, skills, and abilities to complement their own competencies. They know how to make diversity work for them, their group, and the entire organization.

Having the courage to admit your weaknesses means you're willing to recognize when you've made a mistake, and to ask for forgiveness. There is probably no better way to build trust between individuals than to own up to an error that might have affected another person. Of course you should also indicate what you will do better next time or ask for specific advice on how to improve. This kind of vulnerability enables you to heed the powerful enrichment principle we learned from Frank Bird, "good better best, never let us rest, until our good is better and our better best" (Bird and Germain, 1987, p.111).

And what is your trust level for a group leader who not only admits failure but continually seeks ways to improve? This is the kind of person you want on your team. You can openly discuss with this person your own incompetencies or insecurities without fear of ridicule or reprisal. Indeed, you trust this person will appreciate your desire to improve and will offer the guidance you need to do better. You also trust this individual to maintain the confidentiality of any disclosure of personal failure or vulnerability.

Building interdependent trust and belonging should be part of the mission statement for every corporate endeavor that involves people. It should influence almost every conversation we have with coworkers. It is a continuous journey, essential to cultivating an organization of individuals and teams whose personal and shared accountabilities for safety and health are sufficient to achieve a Total Safety Culture. The seven C-words reviewed here are easy to remember, and although their meanings overlap to some extent, each offers distinct directives for trust-building behavior.

Summary and Conclusions. This chapter began with a review of three basic principles defining a behavioral science approach to improving the human element of mining safety, including a rationale for using a behavior-based approach. Then a basic framework for implementing a behavior management system was introduced. It was referred to as DO IT for the four basic processes of behavior-based safety: 1) Define target behaviors to support or improve, 2) Observe critical behaviors in order to help people become more mindful of safe versus at-risk work practices and provide constructive behavioral feedback, 3) Intervene for instruction, support, motivation, or safety self-management, and 4) Test the impact of the intervention process to verify the beneficial influence of the behavior-based procedures and learn how to continuously improve the behavior management system.

Our subsequent discussion of a distinction between accountability and ways to develop personal responsibility went beyond the test phase of a DO IT process. For example, issues of empowerment, belonging and interpersonal trust implicate subjective feeling states which are difficult or impossible to

measure. This might seem problematic for managers inspired by the popular management principle, "You can only manage what you can measure."

There are some things we should do, however, because they are right. Many of the recommendations given here for developing an accountability system that promotes personal responsibility cannot be readily monitored nor measured, but you need to have faith in the research-supported theory that promoting feelings of empowerment, trust, and belonging are important for safety improvement (cf. Geller, 1996a, 1998a, 1999b). This is like taking vitamin pills regularly without noticing any measurable consequences.

We are motivated by consequences, however, so let's consider certain benefits you can expect to gain from a successful behavior-based safety management process as reviewed in this chapter. Since most injuries are caused in part by at-risk behavior, a reduction in at-risk behavior and an increase in safe behavior will lead to injury prevention. However, we'd like you to consider five other benefits that result from people contributing interdependently to an effective behavior-based safety process. These outcomes are critically important, and relate to much more than safety. In fact, they can benefit every important function of your organization. In explaining these we'll review most of the key psychological principles covered in this chapter.

Benefit 1: It Focuses Evaluation on the Right Numbers

How is safety performance measured at most mining facilities? It's measured by final outcomes -- injuries that occur during the year. Companies keep score by trying to improve their incident rate. Do workers walk around the job thinking about lowering the company's incident rate? Can they relate to that? Of course not. It's too abstract and remote. And it's not really under the workers' immediate control.

Top management needs to keep worrying about the outcome numbers, but not the people doing the jobs on the floor. They need to focus on the process -- the day-to-day operations. That's what they can control, and that's the focus of behavior-based safety. When workers concentrate on what they can actually **do** for safety, they'll reach the outcome everyone wants -- fewer injuries.

Benefit 2: It Builds Positive Attitudes

Have you ever noticed how safety-related conversations often resemble an adult-child confrontation? One person holds another accountable for at-risk behavior, as in "I saw what you did." Then safety becomes a 'gotcha' game, reinforced by MSHA regulations and corporate rules. This heavy-handed approach only diminishes a person's feelings of empowerment, importance, belonging, and interpersonal trust.

Behavior-based safety focuses on the use of rewards, positive feedback, and interpersonal recognition to motivate and support safe behavior. This encourages people to get involved in a safety improvement process because they want to, not because they feel threatened and think they have to. Thus, through behavior-based safety people act themselves into a positive attitude.

Benefit 3: It Increases Personal Responsibility for Safety

When people have tools they can use on a daily basis to prevent injuries, and they have support to use these tools, they have real control over safety. If they're held accountable for process numbers they can control, and they believe their efforts will prevent workplace injuries, they'll feel responsible and do more than what's required. They'll feel empowered and want to get involved in an improvement process.

Benefit 4: It Facilitates Interpersonal Coaching and Teamwork

Imagine a workplace where everyone coaches each other about the safest way to perform a job. When workers depend on others in this way to improve safety, they understand teamwork. They appreciate how everyone's safe and at-risk behavior influences the safety of everyone else. With this interdependent attitude, they're willing to use behavior-based coaching to actively care for their coworkers.

The five letters of COACH reflect the main ingredients of behavior-based coaching: "C" is for **care**. Know I care and you'll care what I know. "O" is for **observe**. I care so much I'm willing to watch you work, so I can give you behavior-based feedback. "A" is for **analyze**. I'll think about my observations to understand barriers to safe behavior. "C" is for **communicate**. I'll recognize and support the safe behavior I see, and I'll give corrective feedback for at-risk behaviors in a way that is accepted by the person I observe. "H" is for **help**. Behavior-based coaching helps increase safe behavior and decrease at-risk behavior, and this helps to prevent injuries. It also helps to build interpersonal trust and an interdependent mindset.

Benefit 5: It Teaches and Promotes Systems Thinking

It's easy to get bogged down with handling immediate short-term demands -- like production deadlines -- and lose sight of the bigger picture. Systems thinkers take a broad and long-term perspective. They look beyond immediate payoffs, like the ease, speed, or comfort they get by taking a risky shortcut. They consider the possibility of a bigger payoff in the distant future. They realize their safe behavior teaches others by example and protects them from injury.

Systems thinkers understand the link between behavior and attitude. A small change in behavior can result in a beneficial change in attitude, followed by more behavior change and then more attitude change -- eventually resulting in total commitment. So behavior-based safety sets the stage for systems thinking and interdependent teamwork, and this can lead ultimately to a Total Safety Culture.

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